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Research Article

Leveraging AI, ML, and Gen AI in Automotive and Financial Services: Data-Driven Approaches to Insurance, Payments, Identity Protection, and Sustainable Innovation

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ABSTRACT

Digital native and tech-savvy 'born-digital' or netizens are coining new ethics, norms, and behaviors all at once based on AI and ML algorithms that are 'self'-bagging their couriers, nudging them for politically sensitized and personalized information, provisioning for bedrooms as Primordial soup, and shatterproofing their gizmos. We dub the born-digital netizens as Gen AI and the future as the Hybrid World, where humanity and 'self' will co-exist integrating the 'self' conditioned in algorithmic dreams. We extend this narrative to discuss the design domains of IoT, wearables, smart apparel, VR/AR MR, Industry 4.0, Reinforcement Learning, Smart U, Big data analytics, gossip-crawling, and MotionBI applications. This elaborates on our prior work on IoT, AR/MR, and digital twin technologies with 70 elements of AI and ML algorithms, thereby producing a tapestry of digital twins in multifarious domains, specifically financial services and automotive. The digital twin algorithms not only nudge the design and decision-making processes but also enable innovation in products, services, and business models through smart data-driven decisions, optimizations, simulations, and predictions, leading to productive, efficient, resilient, and competitive organizations. We use these designs to identify ethical, responsible, and sustainable implications and regulations for future-of-work, future-of-society, and future-of-planet. At a broad level, we make policy suggestions for GDPR, Autonomous Vehicles, computer-aided design, Regtech regulatory compliance tech, SME small and medium enterprise Finance 3.0, data assets, and data-driven decisions.

Keywords: Gen AI, Hybrid World, Algorithmic Ethics, Digital Twins, IoT Design, Wearable Technology, Smart Apparel, AR/VR/MR, Industry 4.0, Reinforcement Learning, Smart U, Big Data Analytics, MotionBI, Gossip-Crawling, Data-Driven Innovation, Future-of-Work, Responsible AI, Sustainable Tech, Regtech, Finance 3.0.

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1. Introduction

With its growth, AI is expected to disrupt almost all sectors and can bring a transformative impact. The companies that have leveraged AI saw faster revenue growth, increased cost minimization, and higher competitive advantage. Financial services and automotive are the early adopters of AI. Virtual assistants and chatbots are some of the common and popular applications of AI in the automotive sector. Insurance and financing are where the current investments in technology are made in financial services. However, it overlaps with various other business applications of AI, machine learning, and even older tools like decision technologies. AI research and engineering have been advancing by leaps and bounds to address these challenges. Machines are getting more sophisticated in learning and understanding not only text, image, speech, or video, but also problems like reasoning and retrieval. A growing body of research has the potential to nurture its own great fifth-generation AI, also known as GenAI. The future world will be driven by intelligence augmentation and co-development capabilities. It will be essential for innovative leaders to make the most of their investments in a rapidly evolving technology not just to close any efficiency gaps but also to encourage fresh thinking from employees.

1.1. Setting the Stage for AI: An Introduction to Technologies and Their Impact

Artificial intelligence (AI) is today firmly rooted in location-based mobile apps, transactional e-commerce, recommendation engines, credit scoring, image recognition, disease prediction, and countless other applications. It is on the verge of revolutionizing the automotive and financial sectors. Intelligent systems like autonomous vehicles and robo-advisors are going to influence human lives in a way they have never been influenced before. As evolution progresses in the field of AI, right from AI to generalized AI and machine learning systems being developed by human technicians today, to real full-fledged AI systems of the future, there is a fair chance that these systems will develop emotions or other human-like attributes. For quite some time, these systems have been doing an amazing job of helping humans make their chores better. For example, a virtual assistant that we carry on our smartphones or smart houses is becoming more and more common. In research and development since 1955, AI today is everywhere in all cloud-connected devices with the potential to reduce the load on human beings, leading to an easier life. The technology that already exists is capable of bringing improvements to us, including better decision-making, less human intervention, and optimized processes. AI's ultimate destination is the development of self-conscious systems, that is, AI that behaves like humans. These systems do not exist today, but steps are being made, and these are the systems beyond AI. This chapter is committed to presenting the automotive and financial industries where AI and its potential exist for future systems. These are vital areas for future research and development. AI systems are expected to handle control-related activities in automotive and predictive activities in the financial industry. These systems, particularly AI systems, are expected to act more efficiently and help in providing better rewards in terms of quality, durability, and reliability of services at a lesser cost.

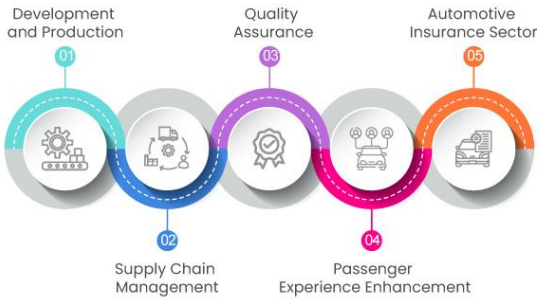

Fig 1 : AI in Automotive Industry

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2. Overview of AI, ML, and Gen AI

AI is the essence and focus of many studies, strategies, and developments. AI is fundamentally about autonomous or intelligent agents that are aware of their environment, can perceive it, and can take actions and decisions that maximize the chances of successfully achieving their goals. AI is simply the capability of a machine to imitate intelligent human behavior. It's how machines are built to perform intelligent human activities that require intelligence. These activities usually require visual perception, speech recognition, decision-making, and translation between languages. Intelligent systems are those that perform or mimic human-like activities such as learning, understanding, and reasoning, and then take action to achieve their goals. All intelligent systems store their knowledge in a way that allows them to come up with actions, make predictions, and learn from the outcomes. These systems are constantly evolving technologies that create solutions to improve human efficiency, and quality of life, and contribute to social and economic challenges. They are indeed everywhere, and their relative importance in improving people's lives is significant.
Machine-generated insights greatly enhance human intelligence, and the rise of AI around us solves practical problems that were previously insoluble by human effort. They are here to accelerate and empower. It's us that create, operate, and determine how it will be used. AI must be tied into our human storyline. Our well-being and livelihood depend on us determining the rules and objectives. We need to make sure AI functions harmoniously with our intentions. Doing so requires us to understand the technology, its applications, and its ethical and social implications. Doing so raises our odds of making AI an instrument that reflects the best, rather than the worst of humanity, and reaching our highest ambitions. We all need to comprehend, reap the rewards, and cautiously control AI systems because AI will most certainly affect our lives shortly.

2.1. Definitions and Concepts

Leveraging AI, ML, and Gen AI in Automotive and Financial Services, AI is the science and engineering to develop intelligent machines or intelligent agents, especially intelligent computer programs exploiting robotic capabilities to help humankind. These intelligent machines may exhibit traits we associate with all living beings – procreation, creativity, ability to empathize, and sustainable exponential learning experience – thus, may possess a super-human strength overall. The AI crisis, known as the paradox of automation, is a situation in which the more efficient automated systems are, the more effective they are in eliminating the employment of humans, causing a major destruction in the economy, and eventually the economy of mankind. AI in the organizational framework is outlined in detail. Earlier specific AI models used to develop AI in terms of robotic capabilities utilize computer programs modeling out AI agility and developing true anthropomorphic sentient beings. Recursive techniques, automated machine learning, and neural automata implementing thinking automata are set for developing exponentially increasing recursive AI development systems.
The purpose of AI in predictive analytics is to infer stochastic models, causality, and intervention. Subsequently, it is recast through generative function capture, data-information-knowledge allowing sufficiency and gap in the AI model. If a recursive AI model uses complete cogence and wise hedonism values as its underlying structures, is there sufficient literature from experts to show that such models are fully supported in terms of their correctness and compliance? Also, is there enough testament from ordinary people on how the resultant AI model enhances their lives yielding betterment? A sufficiently connected cognitive pronouncement of AI would imply fulfillment based on generous application and deployment reaching out to the common person in the street. AI linking communities such as AI x-risks prevention roadmap influence models to ensure safe and human-like behavior. The development of computational metapsychology provides a level of confidence that the development of AI would obey trust guidelines, and is a necessary technology to provide friendly AI.

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2.2. Evolution of Technologies

Artificial intelligence, known as AI, and machine learning, known as ML, are trained models that look for and understand patterns in previously unseen data and then make decisions based on that information. Both are advanced technologies that have been in existence for many years and are also easy to misconstrue. The terms AI and ML are often used synonymously, even by experts, but AI is a broader concept that comprises machine learning and other methods to replicate human cognition. It includes areas of research that lead to computers that can emulate everything humans can do, such as design, solve problems, and be self-aware and self-improving.

Machine learning is a subset of AI that focuses on giving machines access to data so that they will learn about and even solve problems. By training a computer model using large amounts of data and then asking it to predict outcomes for previously unseen data, it becomes adept and useful. In short, ML comprises the subset of AI that enables machine learning using historical data and applies learning to various other tasks without having to program for each specific scenario and use case, and finally applies the models to new data points. It is this ability to learn how to solve problems and make decisions that is making ML a pervasive technology. It is fundamentally changing how all sectors and most business areas can solve problems, optimize decision-making, and drive value.

Equation 1 : Insurance Risk Intelligence (IRI)

$$IRI = \frac{AI_p \cdot C_i}{L_r}$$

Where:

AI_p = AI-Powered Claims Processing

C_i = Customer Insights from ML

L_r = Loss Ratio Estimate

2.3. Current Trends in AI and ML

In both automotive and financial services, a variety of AI techniques are being deployed to learn patterns, make decisions, and solve complex problems. Machine learning is one of the current trends in AI. Companies use machine learning techniques to identify hidden patterns, make decisions, and use anticipatory context-based intelligence to address complex business problems. Many real-world problems are being solved using either classical machine learning techniques or deep learning/neural networks. Intricate issues such as no-call drops, driverless cars, robots, computer vision-based health analysis, and finance management are being addressed and explored. The present situation documents many resultant machine learning models, and complex algorithms help to arrive at optimal solutions with accuracy and resultant benefits while being complex to understand.

Machine learning is one of the current trends in AI. Classical machine learning techniques or deep learning/neural networks are used to solve problems in the real world, such as predictive analysis, forecasting, and transaction robots. Faster learning times, high accuracy, explanations, and data minimization are prime benefits of using machine learning for personal and localized models developed for specific areas of application. The concept of training an algorithm is constantly active and self-modifying. Machine learning solutions are designed to prevent the introduction of a 'latent' bias because we adhere to laws and regulations that govern the application we are involved in. In many cases, companies and IT managers closely work with analysts and stakeholders to explore how machine learning can solve problems in a specific area using real use cases and systems.

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3. Applications in Automotive Industry

In the automotive industry, AI is employed in a wide range of areas, from autonomous and connected vehicle sensor data processing to driver and occupant sensing; from in-vehicle infotainment to charging solutions for electric vehicles. These diversified applications use various AI technologies, including both conventional and the latest, such as deep learning and very large DNNs, to process and analyze their associated multi-modal data. Instead, to illustrate the application of AI in the automotive industry, we will briefly state the challenges involved as well as the state-of-the-art results in some of the custom solutions developed in this area.

With the advancement of industry-grade electronic devices and powerful AI software libraries, the perception and decision-making tasks associated with the automotive industry can be much faster and more robust than using traditional algorithms. Currently, the technological deployment of AI in automotive can be at various levels of progression. For instance, both connected and mutual mobile sensors equip the smart city infrastructure for monitoring and controlling traffic flow, road and parking utilization, and road and driving conditions to enhance secure, sustainable, and green transportation. These essential data, either raw or analyzed, are then used by the corresponding backend systems to deliver customized services such as demand-based traffic management, hazard early warning, emergency communication, auto-assistance, and scene-based police and security patrols.

3.1. Smart Vehicles and Autonomous Driving

In the automotive industry today, we are riding a giant wave of innovation, and the latest advancements in car technology have huge implications for our lives—electric vehicles, connected cars, and autonomous driving. The human-machine interface for the automobiles of the present and the future represents a fascinating and critical area of design research. Several critical areas in this space include perception, contextual data understanding, conversational systems, reliability and trust, security, ethics, and compliance—which are all high-potential areas leveraging AI and machine learning opportunities. In the medium to long term, protocols and standards for user data, privacy laws, and implementation details to enforce those laws will continue to emerge—driven in part by the very complex issues surrounding autonomous driving.

Conversational AI technologies are particularly important in the automotive space for creating an intelligent assistant that drivers and other vehicle occupants can use via natural language interfaces. Conversational AI requires understanding verbal and non-verbal interactions and mapping the context to knowledge of the user, task, and platform content. Key requirements for conversational AI in automotive then include context awareness on content delivery, advanced spoken or text-based natural language understanding capabilities, dialogue management involving task understanding, entity extraction, intent disambiguation, and affect recognition for the recognition of emotions across large-scale populations, as all driver and passenger communications must be conducted in context.

Fig 2 : Future of Generative AI in Automotive Industry

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3.2. Predictive Maintenance

The IIoT, IoT, and IoT-to-cloud networks drive the predictive maintenance (PdM) evolutionary transition. They enable deep learning and generative AI tools that can predict defects and recognize behavioral patterns early enough to allow for intelligent, effective, and cost-efficient interventions, diminishing the need for unnecessary downtime and service interruptions. Currently, companies use PdM tools and analyze unique asset IoT sensor data from multiple sources, but it often is siloed, inconsistent, and untrustworthy. However, leading companies transform IIoT, IoT, and IoT-to-cloud siloed data from various sensor sources through secure on-premises edge clouds, elegantly converge it with real-time cross-source enterprise data, and continuously feed appropriate multi-hybrid cloud AI, ML, and DL models. The latter harvest critical actionable knowledge and use case-appropriate consequences, prescriptively improve situational awareness and automated responses, and support decision-making activities by critical operational, business-to-business, and business-to-consumer applications.

3.3. Customer Experience Enhancement

All of us are customers at some point within the financial services and automotive industries. Each touchpoint with any company from these industries generates an experience that, when combined, will end up differentiating the companies competing to acquire and keep customers. Customization is key when speaking with customers, demonstrating the best conversation or assistance level. Is the combination of customer data, natural language, AI, ML, and analytics the best answer to enable the personalization of experience today according to the customer profile and expectations? Or is it dependent on the company's internal and external processes supported by technology to complement the human and AI chatbots in place? Are customers ready to interact with AI? Are companies prepared to manage AI and humans in the same environment?

The popularity, technology maturity, and low entry bar of machine learning platforms have increased the number of AI uses across companies. The challenge is no longer the platform availability, but the design of an enterprise AI strategy, integrating AI models into the different core business areas where they might be better used, supporting employees with on-demand knowledge, for example, or shaping the virtual intelligent agents, including chatbots, that will assist customers in their day-to-day interactions. Voice and chatbot democratization with virtual intelligent agents in industries like finance or automotive is evident. Capabilities offered have started to adapt to interact with particular audience areas not only by using natural language but also by the support of state-of-the-art voice and language patterns created with machine and deep learning models.

4. Applications in Financial Services

There are several use cases for creating AI-powered virtual agents and digital assistants for financial institutions, including (but not limited to): Customer service: Automating banking and legal services related to deposit and account inquiries, credit card inquiries, address changes, and new account applications/loan origination. Account inquiries and servicing: Automating all related to account balances, incoming transactions, stop payments, and transfers, among others, on digital channels. Loan and mortgage inquiries and prequalification: Responding to customer inquiries on loans and mortgages and advising on what it takes to prequalify for one. Gen AI customer insights augmented virtual agent: Enriching the virtual agent with customer insights through generating customer insights and suggestions. Backend business process conversation coding patterns: Processing customer inquiries on backend business processes. Biometric enrollment and authentication: Performing customer enrollment in voice biometrics or authenticating customers using voice biometrics, password resets, and customer journey history. Customers will also have an opportunity to request specific customer-related services and self-service actions.

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4.1. Fraud Detection and Prevention

Fraud detection solutions in the financial services space have been around for a while. In general, the workflow for these solutions involves, to a greater or lesser extent, creating custom rules to detect specific behaviors that businesses consider fraudulent. These could be done at a wire, account, or card level. Examples include creating rules to detect several transactions within a small time frame, detecting spending on value-added goods, detecting purchases from suspicious geographies, prevalent magnetic card swipes for chip-enabled cards, and so forth. However, all these rules suspect transactions that are well into the fraud cycle and do not provide advanced warning of potential risk. Customizing these rules for a particular financial institution, geographical location, or customer segment has been the bread and butter for vendors and financial and card services for a while. In addition, the modernization of core banking platforms is a multi-year, multi-billion-dollar initiative. There are a couple of optimization cycle projects along the way to decommission legacy systems, but these are also multi-year initiatives. Consequently, it is very difficult to integrate paradigm-shifting technology, such as AI/ML, until the technology has been established, not just in a startup or proof of concept/pilot mode, but in a mature mode, with references specifically in the banking and financial industry.

4.2. Risk Assessment and Management

AI is redefining and revolutionizing risk assessment and management with innovative methods that deliver incredibly high-level efficiencies. Many kinds of credit risk have specific signatures in the vast array of data that surrounds lending activities, allowing algorithms to detect these signatures and, in some cases, surpass human intelligence in predicting the risk of default and other undesirable loan outcomes. Using AI can deliver not just a marginal improvement in the efficiency of an internal rating system, but leave it better calibrated and understood. Banks use a lot of traditional statistical models to deal with capital markets and regular management and supervision, and over time, these systems have become complex, rigid, and expensive. AI and ML methods are far better suited for very complex systems like these, whether it is from the perspective of model transparency.

AI is completely changing the business of managing credit risk. Innovations around fraud, operational risk, and anti-money laundering control are emerging rapidly, consisting of a new wave of technologies that may give an entirely new purpose to a risk function that formerly struggled in the more traditional world of ex-ante and ex-post insurance. AI creates the ability to 'see' the patterns that were previously concealed by the vast ocean of data. In insurance, the influence of the digital world was muted by the long history and slow rate of internal data generation. However, insurance companies have pivoted towards using new digital data to compete and have created platforms, data analytics, and managed services business units to maximize the benefit from digital data serving specific risk or banking-related challenges. The feature of digital data is that it accumulates quickly, giving the possibility to realize AI and enable hyper-specific risk pricing for insurance in the new digital world.

4.3. Customer Service Automation

Just as the back office can be reimagined using digital agents, so too can the contact center. We tend to think of the machines as replacements—or potential replacements—for flesh-and-blood customer service agents. The reality is more nuanced, and at least in the near term, even more promising. At least in the near term, the more realistic picture will see humans almost everywhere, within contact centers and without—on the phone, on video calls, digitally rendered in chatbots, or with augmented and enhanced ability to engage callers and solve their problems. A good example of this form of partial automation is voice bots—homegrown or open-source subsets of voice assistants. In the coming era of Gen AI, we will use these platforms as a starting point and retrain them to handle the specialized requests that are typical of contact

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centers such as financial services firms. A well-trained bot can handle basic, routine, repetitive tasks. It can handle fact-based inquiries—balance inquiries, and billing requests—and successfully execute a fair percentage of basic contact center requests. It can recognize instances where a call may be less satisfactory (complaining about a billing issue, for example) and then forward the call to a human agent, thereby helping to ensure that calls remain highly satisfied. Ultimately, and over time, AI and digital agents can help to bring about a state change in how contact centers work and perform as well as the level of service they deliver. Optimistically, the result might be a convergence of two seemingly disconnected worlds. Some contact centers are highly digitized already. They use AI for forecasting, especially in terms of how many agents they need to meet contact demand. They use AI for quality assurance, to measure call and satisfaction quality. They use it to optimize call routing. And then, separately, they might use chatbots for influencers, to guide website visitors through the sales process, route customers to services, support customers in choosing products, or assist with FAQs. In the future, contact centers might host a single backbone of AI capable of overseeing contact center operations from end to end.

5. Data-Driven Approaches in Insurance

Data-driven approaches show considerable promise for solving key challenges across multiple areas of insurance. These approaches aim to replace manual processes with automated solutions that leverage vast amounts of data and layer it with advanced analytics, emerging technologies, and alternative data sources. Data-driven approaches are transforming product innovation, risk selection, underwriting, pricing, claim handling, fraud prevention, distribution, customer engagement, and operations. Technological improvements reduce the overall friction involved and streamline customer journeys, leading to new solutions that are faster, customized, more transparent, and fairer. Companies invested in advanced technologies and digitalization have integrated data-driven approaches seamlessly into their business models. Additionally, evolving data ecosystems present increasing opportunities to use more data for the benefit of society via algorithms that can unlock significant value.

Fig 3 : AI in Insurance Industry

Data-driven approaches cover data-generating activities that are associated with the collection, use, analysis, and monetization of data. Data-generating activities are responsible for the production of data and include transactions, events, collaboration, research, and sensor networks, which all generate data, as well as broader inferences, insights, analytics, and decisions that drive and leverage data. The ability to monetize data is inherently linked to the creation or expansion of digital business models but also depends on the competencies that derive from the data: deep technological knowledge, innovative capabilities, data ecosystems and external partnerships, data science expertise, and intelligent understanding and compliant use of the data, such as technologies, algorithms, and interpretation. Societies taking advantage of data-driven approaches strive to disseminate competencies to boost their industry and governments and, in

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particular, create conditions that allow deep enough digital competencies to unlock value from data while minimizing the trade-offs that arise from compliance and ethics.

5.1. Telematics in Auto Insurance

The most prominent use of AI, IoT, and telematics systems is for auto insurance. AI and ML models have the capability to perform a number of key activities like risk analysis, personalized pricing, and automated claim processing. Apart from that, telematics also helps in value-added services like road usage-based pricing, usage-based insurance, or real-time driver support services. This ensures cost efficiency, value addition, and frequent customer engagement.

The idea is to leverage the data collection capabilities of modern vehicles, with the help of IoT, to provide a better user experience. This is achieved through the concept of usage-based insurance, through which the customer gets personalized pricing based on their driving behavior. The user's risk is analyzed through machine learning models based on the huge amounts of customer data available. Image and video recognition capabilities are added to ensure user safety. The rise in popularity of telematics glass boxes to extract vehicle and driving data and their integration with AI and ML are presented. Different business models that incorporate telematics data are listed and analyzed.

5.2. Personalized Insurance Products

Personalizing the insurance offer is a strategy used in various industries to gain new clients and retain the existing ones. Whereas in the motor insurance market, personalized insurance products based on UBI are generally established and sold, there is currently no personalized insurance offer for theft risks. With the increased use of device-to-device communication between vehicles, to mitigate risks to infrastructure or traffic rules violations, the vehicle itself will be able to detect the presence of other vehicles in its window, link to their TCU, and receive certain road information. With the introduction of these new technologies and the theory of game originating from the communications between autonomous vehicles on the road, an understanding of the clandestine activity in a declared risk area and the participation of an identified vehicle in an illegal activity could become more bikeable. For example, new servers could be set up to collect fresh information from these various sources in a safety logic that can take over the conduct of the vehicle.

With our proposed ISMP model, in addition to personalizing the damage insurance portion of the premium, we will also revise the theft premium and show the impact on the insurance penetration rate. Currently, it is established that the detection of other vehicles, although possible by direct relation with their TCU, must be better managed, and that the association that the vehicle builds between a license plate IC card and the driver, when activated will reinforce user privacy. We are also motivated by the fact that today women only represent a small percentage of train drivers. Indeed, the technical constraints are such that safety authorization is highly constraining, and potential candidates may be afraid to request highly penalizing schedules, men should also benefit from specific support if they have a high fear of being integrated.

Equation 2 : Secure Payment Trust Index (SPT)

$$SPT = \frac{T_f + G_d}{F_v}$$

Where:

T_f = Transactional Fraud Detection (ML)

G_d = Gen AI Detection of Anomalies

F_v = Financial Volatility Score

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5.3. Claims Processing Automation

The current claims processing cycle in the insurance industry consists of four stages: submission, adjudication, payment, and reporting. The first two stages include the manual processes of categorization. Specifically, at the submission stage, claims have to be tabulated based on the information received. Towards the end of the first stage, the system sends an auto-acknowledgement. Finally, the details have to be auto-populated. It is during the verification stage that additional checks have to be done to ensure accuracy. Currently, categorizing documents or images at the submission stage can be a manual procedure or an automated one. In an automated process, the system recognizes images on processing by the server. The "original document" can be an image, CAPTCHA, barcode, signature, static text, etc. At present, the single service usage scenario is determining the "confidence" of the "original document."

Concerning the "adjudication" stage, the claims finalization can be done in the system. Users can view the details of the submitted claims to make approval decisions. Few claims can also be given automatic approval based on the auto settlement criteria defined at the claim type level. Towards the beginning and end of the adjudication stage, system-generated alerts have to be checked. After the adjudication stage, auto-approval percentages across distinct lines of businesses can be computed. Following adjudication, at the payment stage, the payment details of the approved, rejected, partially paid, or partially rejected claims can be generated, and the checks and auto credit functions can be carried out. It is after the completion of this stage that the against form entries and submissions can be made and analyzed concerning the employer payment statement. After the payment, printing, and employee payment statements can be checked, confirmed by users, and marked as completed. The final stage, reporting, includes the secondary sub-stages of back-end reporting and front-end reporting, the results of which can be sent to niches for results. It is after the reporting that claw-back and co-pay recoveries can be performed based on the stipulated criteria.

6. Innovations in Payments Systems

In the past ten years, technologies and other untraditional players have led criminal organizations around the world to professionalize, expanding the threat and compounding its associated risks. For e-commerce to boom, those players have designed and used a global system of online payment systems. All of these have opened a new gateway for nefarious activities. There are two alternative views on the nature and size of systemic innovation in the payment space. One believes that these forces have caused nothing to happen, largely because there are now only a handful of global system firms in the market. The other sees those same drivers as being forces for change that may have produced a 21st-century payment systems revolution.

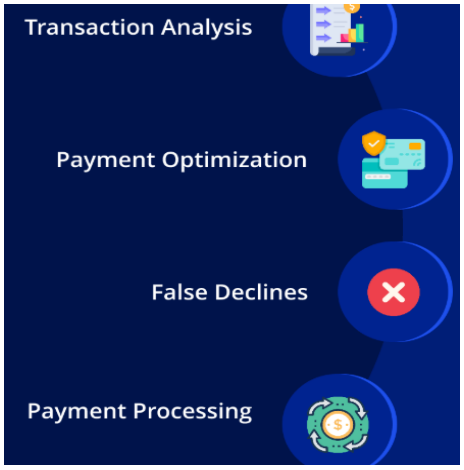

Fig 4 : AI in Payment

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We look to test those two competing views, arguing that the global economy now needs to rethink capital markets in general, and payment systems in particular. They carry out three tests to analyze the existing body of evidence to see how much systemic change has occurred, providing their conclusions. They argue that our global payments systems ought constantly to be in the business of providing good outcomes by looking inward and outward and being ready and able to adapt to and evolve with fast-moving global markets. The current global financial crisis has revealed how important this basic role of payment systems is. Their high-level intention is thus to promote the conditions for systemic change and resulting innovation. With the fast pace at which the global economy is developing and changing, we believe that understanding the essential nature of systemic change is of critical importance in defining the required payment system outcomes.

6.1. AI-Driven Payment Fraud Detection

Payment fraud detection is another area of extreme interest and exploration for the financial services market segments such as banks and fintech organizations. In the traditional payment remediation phase, financial services firms could use anti-fraud rules, which were code blocks to detect specific events. In the current scenario, such anti-fraud rule engine-based paradigms require reliance on experienced analysts supported by programming expertise to be effective. The risk faced by financial firms remains high, with legacy transaction detection systems yielding too many missed fraud cases and declining accuracy. AI-driven payment fraud detection is appealing over these conventional methods as it provides industry-leading accuracy with its pre-packaged models out of the box, an 80% reduction in false positive cases, rapid remediation time, and a substantial decrease in costs. These models are pre-trained, and it costs nothing to make manual adjustments in this mode by analysts while coming out of the box, which is a quick way to address unsolved and challenging problems. AI-driven fraud detection is a game changer in the managed resource toolset with a clear competitive advantage for firms struggling to keep pace with real-time threat detection.

The threat landscape in financial sectors seems to be growing due to a growing number of experienced cybercriminals, faster payment movements through digital transactions, and complex fraud strategies. The shortage of anti-fraud analysts and big data systems increases financial risks and accelerates fraud detection costs. Financial services are working hard to determine the right criteria: few organizations are excessively expansive with mammoth risks. Businesses in a digitalized economy are continuously evolving, with payment transactions through portable apps, mobile apps, and innovative e-commerce channels, and detecting fraud occurrences in high-speed payment transactions for both volume and transaction profile is now important. This modern threat landscape can be facilitated by payment transaction monitoring systems that use a variety of behavior alert scenarios to check millions of transactions from a variety of locations in the world. However, most current detection systems only concentrate on designated signals or alert rule risks.

6.2. Blockchain and Payment Security

There are a variety of diverse applications for blockchain technology, which is often referred to as "Internet of Value" technology, in automotive and financial services. One of the best-known is the use of blockchain for secure payment. It is a primary underlying principle of Bitcoin. The concept was then generalized in the form of a universal cryptocurrency payment platform, which was partially implemented in Ripple. It has also been more recently explored and implemented by a large number of providers of cryptocurrency coin offerings and similar token-based pre-sale offerings. This type of application, in one form or another, is relevant to both automotive and financial services. Every car will need to pay for numerous services. Every

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financial service transaction will need to be identified, agreed to, and paid for. Depending on the nature of the data, value transfers may also need to occur as it is shared.

These payment applications may all rely upon many of the underlying cryptographic strengths of blockchain, but they are based on the application of these technologies to come up with practical, secure, and inexpensive ways of managing and transferring digital value. Throughout history, the secure, reliable, and cost-effective transfer of value has often been seen to be as important as the actual value itself, and blockchain technology certainly demonstrates the potential to offer new value and benefit in this way. The field of blockchain payment research and development is very actively developing. Understanding their potential contributions is thus important to the success of both the automotive and financial services industries.

6.3. Mobile Payment Solutions

Mobile payments represent the easiest way for consumers to make payments, and a mobile payment solution provides a customer with a payment environment that is fast, secure, cost-effective, and efficient. The mobile payment solution is a real-time transaction support system. It is accessible to nearly anyone in the world through services delivered over the mobile network. It is convenient to use, secure to operate, and available to consumers, merchants, and service providers during transactions. With a mobile device, consumers can purchase anything they want when they want it, and mobile payment systems become an integral part of m-commerce. Many consumers require the capability of making mobile payments using their existing credit or debit cards, linked directly to their bank accounts. Notification options and marketing information about vendors offering mobile payment options for goods and services are also valuable to consumers.

Mobile operators can use mobile payment techniques to extract full advantage from mobile services. Cardholders have the option of adding card registration, PIN verification, authentication, card authorization message approval, and receiving card authorization messages on mobile devices. Furthermore, a card number can contain mobile device-specific indicators as part of the card's primary account number at a generic level, so a mobile operator and a card issuer can enable mobile payment features. The card readers and cardholders accept these new card details and can work with mobile payment features.

7. Identity Protection Strategies

Protecting an organization’s or an employee’s ID also requires a new perspective as compromise becomes an increasing concern. New identity capabilities and techniques will be critical to help organizations and individuals know who or what they are dealing with, as digital personae and shadows are adopted, especially with behavioral biometrics. The connections between digital identities, security, and safety, especially in spaces that touch upon heavily regulated activities or have safety implications, such as financial services or automotive systems, will have to be closely examined. Behaviorally informed security and privacy practices will necessitate requiring and enforcing adequate but appropriate security and privacy behavior to minimize compromise risk.

New personal and professional ID protection strategies are required, especially as individuals’ actions and liabilities in business and personal environments continue toward entanglement. Furthermore, personal advanced ID is transforming occupational identity, ensuring engagement and support become important as employees spend decades in the workplace. And not just for employees. Some ID attributes, especially digital traces, are being used in unintended ways to make a variety of judgments about individuals that are not ID-specific. Good practices define organizational digital, social media, and online use policies and

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measures to enhance employee engagement while ensuring personal and organizational exposures are minimized.

7.1. Biometric Authentication Methods

With the proliferation of mobile devices, as well as the widespread use of the internet, the world has become a much smaller place. It has also become much easier to access online platforms that contain extremely important personal information, such as health information, investment account data, social media accounts, and payment accounts. Most applications continue to use a username and password combination to authenticate users when logging into various personal applications. Despite the limitations of these methods, most established and new applications continue to use these methods because of their ease of use, the wide user familiarity with them, and the low technology acquisition costs. However, other unique authentication methods continue to be developed, often revolving around the display of biometric signals, such as fingerprints, iris scans, facial scans, body movement data, electrocardiograms, and electroencephalograms, to push the limits of this technology.

As the use of personal computing devices proliferates, user ID and authentication methods that are easy to remember and manage are needed, such as eight-character passwords, and most users ignore weak password policies. As a result, the current security position of most personal application databases is weak, exposed, and predictable, creating opportunities for countless malicious attackers. High-profile data breaches continue to occur as a result of this weakness, with predictable and catastrophic consequences, and in the healthcare system, these data breaches may occur with severe health and financial consequences. Biometric-based user authentication methods, as opposed to user ID/password-based authentication methods, currently widely used, eliminate most of these risks by binding the user proving identity to a physical biometric, such as a fingerprint, iris, face, retina, electrocardiogram, or another signal, and then convert the signal into an authentication factor or biometric template. Despite the higher cost of such biometric identification technology, the elimination of associated security threats and the heightened security benefits associated with decreased financial transactions, personal data, health, and safety risks have all made such biometric authentication methods for users attractive and popular for a highly sensitive authentication purpose, such as financial transactions, secure access to a personal computing device, and health and safety decision-making.

7.2. AI in Identity Verification

Consider a future when consumers no longer need to remember passwords, answer personal questions, or use tokens or any other specific device to confirm their identity. Understanding consumer behavior and leveraging biometrics and AI, companies authenticate the user in a non-intrusive way by selecting the most convenient biometric solution in different scenarios and greeting them with the user interface or preferred services, increasing overall user comfort. Even more fantastically, a regional bank offers its clients credit cards embedded with a fingerprint scanner that requires digit verification for transaction approval. The bank offers this service in a world where AI, along with ML, makes this service more economical while quickening the time to market and reducing associated risks, thus making the service convenient and scalable.

There are tens of billions of transactions happening across the world that require confirmation of identity daily. Identity verification is fundamentally necessary for regulated institutions to avoid negative consequences or costs for not following anti-money laundering, know-your-customer, or other mandates. Unfortunately, the challenge of identity theft continues to grow. But AI and ML contribute to detecting counterfeit documents, generating a facial detection system that works under different situations and conditions, determining the possibility that a user is under the influence, recognizing uncommon

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behavioral patterns, or defining the flow's abandonment stage. Understandably, several processes and sub-processes demand different procedures and strategies, but all benefit from having non-intrusive and unconscious solutions.

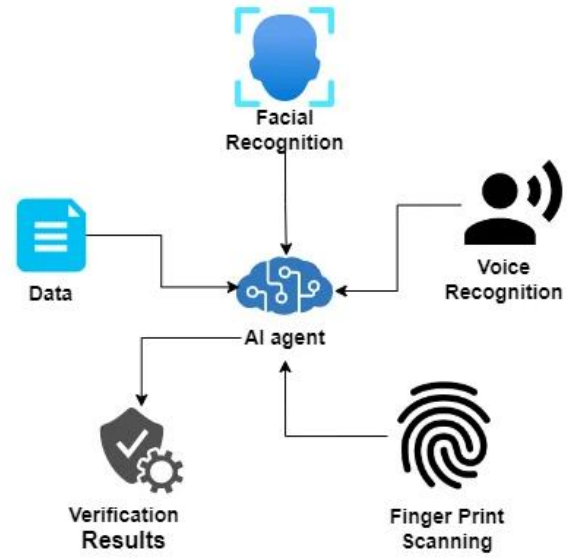

Fig 5 : AI in Identity Verification

7.3. Regulatory Compliance and Privacy

Preserving and respecting customer and employee privacy through the responsible handling of personal data and complying with data protection laws is critical to the success of any AI initiative in the financial services industry. Most companies have AI ethics policies as well as risk assessments and guardrails, and they conduct impact assessments to flag potential risks to both project and corporate reputations if bias or discrimination are involved. However, most companies do not implement checks, and if unethical behavior is suspected, they rely on employees to speak up. Whistleblowers, however, are too easily targeted. In addition, the quality and quantity of most companies' datasets and the way employees are trained on ethical AI considerations, such as the protection of personally identifiable information, means that unethical behaviors due to a lack of awareness are more likely to continue. As machine learning expands into new domains, additional use case security landscape complexities can lead organizations into a false sense of security.

More regulation is on the horizon. The upcoming AI Act will bring much more visibility to what is required of AI technology, such as documentation, data governance, human oversight, resilience, accuracy, respect for privacy, non-discrimination, transparency, traceability, and the way metrics and effectiveness are reported. In addition to the Terrace Model, the General Data Protection Regulation is a set of regulations for this region that mandates that individuals maintain a right to human determination. For purposes of fairness, techniques that ensure that the learning model does not reflect race, ethnic origin, religion, disability, age, gender, sexual orientation, or any other specific agnostic classes could help improve regulatory compliance. Although these legal requirements, if applicable, will present AI groups with much more significant technology and business challenges than those companies face today, they also provide a great opportunity for more business-strategic AI contributions. With a recognition that the golden rule is also applicable to AI development, collaboration between companies and their customers, among corporate neighbors, or governments and private sectors could occur. As part of corporate governance, an AI governance committee would manage this.

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8. Sustainable Innovation in Automotive and Finance

The automotive industry is on the cusp of an era defined by smart cars. Behind the scenes, these smart cars depend largely on in-cabin sensing technologies, including cameras and microphones that enable end-to-end human sensing and understanding simultaneously while addressing driver and passenger privacy. By using AI/ML models that communicate with cameras and microphones to derive knowledge and perception, and interact in real-time with safety applications in the car that alert drowsy or distracted drivers, we enable safer driver assistance systems and also provide enabling technologies that offer personalized consumer experiences from the moment a person opens a car door to the moment they exit. The purpose of this presentation on AI and ML is to enhance safety in the car through the senses of the driver and scale those AI technologies to understand how the driver feels emotionally when making a purchase decision overall while at the dealership, which can greatly enhance the return on investment in the respective applications.

In the finance sector, these same types of end-to-end AI/ML technologies enhance professionals from bankers to wealth managers and mortgage loan officers to real estate professionals with AI assistance in quantifying human emotion to enhance experiences with a tangible ROI overall while at the dealership, and applied across other sectors. We use similar de-biasing methodologies in gender diversity to increase financial targets for women who excel in hedge funds and project how these companies will perform better overall during their lifetime of earnings, which is an innovative and growing focus of sustainable investing in financial services. Our ultimate goal in leveraging AI/ML and Gen AI is to help software write better AI software in building both AI models and future leaders who will create the next greatest AI models for your institution, industry, and organization.

8.1. Green Technologies in Automotive

In the automobile industry, innovation in the field of transportation is a must. The challenge is to find economical, reliable, and eco-friendly technologies that can replace traditional ones. The Hybrid Electric Vehicle (HEV) is one of the electric vehicle technologies that can meet challenges in terms of economics, power, range, and lifespan. In the proposed study, there is an interest in energy storage systems, more precisely the lithium-ion power battery for electric vehicles. Indeed, the lithium-ion battery system is an essential part of the hybrid electric vehicle, and it is the natural precursor to a potential all-electric vehicle propulsion technology that can minimize exhaust emissions and dependence on petroleum-based fuels.

This calls for the development of methods and tools, modeling, and design of lithium-ion cells in automotive or financial services as an initial battery used in electric transportation. The combination of lithium, the lightest metal, in the negative electrode gives lithium-ion technology the highest energy density of any rechargeable chemistry available today. Consequently, this technology has become the essential choice for vehicle manufacturers and drivers. The issue of vehicular emissions is now becoming an increasingly critical factor in air quality in all the world's major cities. With over half of the world's population now living in cities of various sizes, and with further urbanization expected, the consequences of growing air pollution are both acute and inevitable. The electric vehicle with a hybrid propulsion system is increasingly being seen as an extremely promising path to more eco-friendly and efficient driving.

8.2. Sustainable Financial Practices

Conduct business by high standards of business ethics and be transparent about how we conduct our business and manage risks. Conduct business with honesty and integrity and by recognized international standards of good corporate conduct. Deal with business partners, employees, and within the communities where we operate in a fair and non-discriminatory manner. We have a proven track record as a responsible corporate citizen, which is achieved through high ethical business standards, transparent business

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practices, and consistent reporting. Our commitment does not stop at regulatory compliance. We proactively disclose financial and non-financial performance across a range of social, environmental, and workplace topics. Our judgment supports the Sustainable Development Goals under the 2030 Agenda, and we advocate in favor of ethical, environmentally friendly, and socially responsible sustainable practices when making business decisions and financial transactions. Our commitment is not new, neither is the environmental, social, and governance data we have been disclosing. Last year, we approved a framework that brings us even closer to our commitments and stakeholders. Consumers, companies, investors, employees, regulators, and even society at large are increasingly interested in understanding the impact of the world they are in. Hence, we consider the ESG topics to be critical for our banking activities not just because we are committed to the progress of our economy, industry, and society, but also because these topics are material. It is significant to disclose reliable ESG data in the financial market to allow stakeholders to make informed decisions.

Equation 3 : Sustainable Innovation Quotient (SIQ)

$$SIQ = \frac{D_i \cdot S_m}{E_c}$$

Where:

D_i = Data-Driven Innovation Index

S_m = Smart Mobility Metrics

E_c = Emission Cost Indicator

8.3. Impact of AI on Sustainability

The exploitation of energy resources for powering AI systems can have adverse effects on the climate unless it is managed properly. The challenge is to support technology and business model innovation through collaboration. Indeed, some of the largest language models today consume as much energy as 280 data centers implemented by AI companies, powering AI workloads, thus underlining the critical issue of climate change. These data need to be calculated via AI. The consumption of data for the globe's largest pre-trained language models causes a large carbon footprint. Furthermore, the training of machine learning models leads invariably to higher energy consumption. Energy and climate policies for AI should simultaneously support technology and business model innovation.

The international policy community should support this by focusing on some specific areas such as fostering international collaboration on carbon labeling standards for AI; adopting policies that facilitate the deployment of energy-efficient transformation technologies such as hardware emulation and the adoption of energy-efficient models; and rewarding and making it easier to use open, transparent, and rigorous benchmarks for AI performance. Government agencies should assess how best to support collaboration on large-scale fundamental AI research projects that accurately represent downstream uses in science, technology, engineering, and mathematics research. In contrast, industry should work with researchers to develop more energy-efficient algorithms and models and publicize the results, use smaller models that reduce computing energy in situations where large models may not be necessary, and conduct research into long-term climate impacts. Finally, the academic and research community should foster new research activity that blends sustainability with AI and endeavor to reduce energy consumption via AI explainability models and other AI technologies.

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9. Conclusion

In his book, Kevin Kelly introduces the concept of Gen AI, a new type of narrow AI that is the offspring of Smart Agents. He highlights that Smart Agents economically become the dominant form of AI at a particular stage of development. We are currently at the beginning of the first of several stages where economic incentives collide with obsolescence. The result is that at every level of society, we are being pressured to create AI offerings. We are rushing to fulfill these needs with myopic tasks and services, overlooking collaboration and the beneficial complexity of connected agents. New projects in AI and machine learning have been initiated at a rate of 8.5% per month over the past year. We have entered the Kelly Stage of AI. In this chapter, we have widely surveyed the landscape of projects driven by economic incentives towards narrow AI tools and services in Automotive and Finance.

Businesses are leveraging AI and machine learning across a diversity of functions and optimizing platforms, services, assets, and processes. The advent of AI, machine learning, and personalized digital omni-channels are leading to exhaustive product offerings. This is all-pervasive. The belief is that with customer interface soon to be commoditized, product innovation through AI and machine learning is the next and final level of value addition. However, as Kelly stresses, the Gen AI agents are created, and the agents will select the projects and tasks. These agents must be set up to be socially aware and adopt best ethical practices. Only then can these narrow tasks and services grow into a rich, symbiotic, and beneficial complexity of connected agents. That is an important evolution. A naïve short-term belief is that business model innovation by talent will deliver a sustainable competitive advantage. Customer and value-chain groups put in place through AI and machine learning generally possess a more durable and reliable life. In conclusion, the existential question is not whether to embrace AI and machine learning. It is about the channels, platforms, and partnerships being the substrate for the new age economy driven by Gen AI.

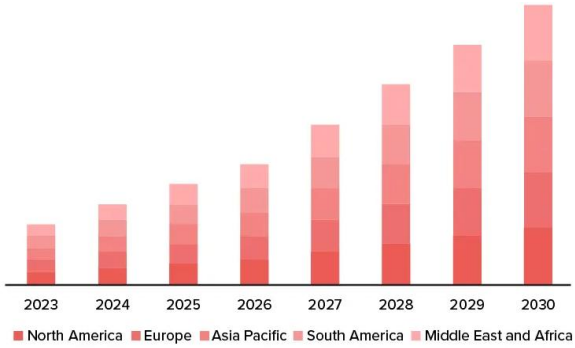

Fig 6 : AI in Insurance is Poised to Transform the Industry

9.1. Final Thoughts and Future Directions

In conclusion, while we have offered strategic guidance to companies as they seek to harness the potential of emerging technologies for their operations and organizations, the technologies we have explored here will continue to have impacts that are both profound and unpredictable. New and unanticipated applications and uses of these technologies will continue to appear and are likely to both empower and challenge leaders who seek to harness them for societal and organizational gain.

We are just at the dawn of trying to understand what these technologies make possible: what they free us up to do, what they enable us to accomplish, where they help us, and where they can come between us helping ourselves and our loved ones, customers, and employees. They are throwing ideas at us faster than we can physically bring them to market. It is a thrilling time to be working in this domain. We are excited to start this journey and hope you can learn as much inside this field as we have.

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